



## Chapter Eight

# The Future of Pollution Prevention

### ■ Guest Comments:

**Joseph T. Ling, 3M**

**Warren R. Muir, Hampshire Research Associates, Inc.**

**David L. Thomas, Illinois Department of Natural Resources**

**Harry Freeman, University of New Orleans**

**Joanna D. Underwood, INFORM, Inc.**

**Gerald Kotas, U.S. Department of Energy**



## Introduction

What does the future hold for pollution prevention? To address this question, we enlisted the help of a number of guest authors, including some former EPA employees. This was not an attempt to provide a “balanced” set of viewpoints on prevention — pro and con. Rather, we identified these authors because of their exceptional contributions and long-standing commitment to prevention.

Not surprisingly, no consensus emerges on the future of pollution prevention from our guest commenters. Some are sanguine, others less so. Harry Freeman believes that the future holds environmental successes not even dreamed of today. Warren Muir is pessimistic that despite a great deal of activity related to pollution prevention, it has had no discernible impact on aggregate toxic chemical waste generation and industrial practices in the United States. Joanna Underwood wonders if we have been measuring the wrong thing — there are 4 billion pounds of toxic releases, but 6 trillion pounds of chemicals in commerce.

Concerns such as these lead to additional questions about how pollution prevention can be incorporated into the way Americans live and work:

- How do we put prevention in the larger context of other paradigms for environmental protection?
- How do we take advantage of opportunities to prevent pollution and minimize waste in consumer products?
- How do we make prevention a meaningful concept for business and government decisionmakers?
- How do we build new partnerships and constituencies for pollution prevention?

Our guest authors have valuable perspectives on some of the key challenges that we face in answering these questions:

- *Prevention and sustainability*: Joseph Ling, Joanna Underwood, Gerald Kotas, and David Thomas all look at prevention in the context of progress towards sustainable development. For our contributors, pollution prevention is not an end in itself, but a means for reaching the larger goal of sustainability.
- *Prevention and products*: Joseph Ling, Harry Freeman, and Joanna Underwood see consumer products as the next challenge for prevention, recognizing that public health risks and the limitations on the benefits we can get from working with industrial processes. Of course, the question of what makes one product “greener” than the next is a source of much debate. This report touched on the issue of moving the market towards environmentally-preferable products in Chapter 2.

- *Reaching to right decisionmakers:* Warren Muir and David Thomas point to the need to reach the people within companies who make the decisions, those responsible for product and process design and operations.
- *Tapping new partners and participants:* All of our guest commenters suggest that the challenge of the future requires a broadening of participation in pollution prevention — from tapping the enthusiasm of our youth, according to

David Thomas, to Gerald Kotas' call for new partnerships that lead to creative solutions and fundamental lifestyle changes.

How far have we come and how far do we have to go? Listen to what our contributors have to say and decide for yourself.

### Have We Piqued Your Interest?

Readers interested in the burgeoning literature on the future of pollution prevention can also look at:

- “Why the Pollution Prevention Revolution Failed — and Why It Ultimately Will Succeed” by Joel S. Hirschhorn. *Pollution Prevention Review*. (Winter 1997).
- “The Unfinished Business of Pollution Prevention” by Kenneth Geiser. *Georgia Law Review* Volume 29:473 (1995).
- *Frontiers in Pollution Prevention* from The Michigan Great Lakes Protection Fund. Available through the Tellus Institute (617-266-5400). (August 1996).



## Next Stop: Designing for Sustainability

by

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Pollution prevention has come a long way in the last several decades. It has been incorporated in public policies and private practices worldwide. The adoption of the Pollution Prevention Act in 1990 further strengthened the application of pollution prevention in this country. Pollution prevention has proven itself a powerful and efficient tool in making manufacturing facilities more environmentally friendly.

But a new horizon is appearing in environmental issues — that of sustainable development. We now need to apply the lessons learned from pollution prevention to this new approach, which should be both a goal and an agenda for nations to pursue in the coming century. Sustainable development involves many factors, including economics, renewable and nonrenewable resources, and social, health, and ecological concerns. Because sustainable development grew out of a concern for the environment, I believe that the principles used in environmental protection will also help to achieve this new goal. The concept of prevention is the basic building block for achieving sustainable development.

Looking back at where we've been: In the 1960s, we emphasized pollution control. We added equipment that removed pollutants before they reached the natural environment. Unfortunately, you cannot make pollutants disappear. In almost all cases, you only change them from one form to another, which can lead to cross-media transfer of pollutants.

In the 1970s, industry moved another step forward by searching for alternative solutions to the pollution problem. At 3M, we began looking into the manufacturing process for ways to eliminate pollution at the source, before cleanup problems occurred. Pollution prevention was a logical extension of pollution control. However, neither can assure sustainable development and growth. That's because control and prevention efforts address only what occurs inside the plant; they do not consider downstream problems.

The next logical step for industry was to deal with the environmental impact of products after they leave the factory, which has been referred to as Design for the Environment. My definition of designing for the environment is a "design process involving all environmental constraints and opportunities and producing no or minimum damage to the environment from the raw material selection, production, and product use, to its final disposal, as the design objective." At 3M, for example, we designed a solvent-free adhesive for our popular Scotch brand Magic Transparent Tape to avoid air pollution.

Another example of designing for the environment is the elimination of chlorofluorocarbons (CFCs) from auto air conditioners. At chemical plants, CFCs are no longer being manufactured for use in the coolant, eliminating an on-site pollution problem. Further, auto companies don't use CFCs to charge air conditioners. And you and I don't contribute to the problem when we go to repair garages to have our car air conditioners recharged because they use a CFC-free refrigerant. CFC pollution was designed out of the manufacturing process from the beginning of the process to the end.

And yet, even diligent application of Design for the Environment cannot achieve sustainable development and growth because the environment is only one of the many elements involved in sustainability. The next logical step is what I call *Design for Sustainability*. The sustainability of a desired quality of life for all people, for future generations, will depend upon the establishment of sustainable systems in multiple spheres:

- A sustainable economic system needs to provide for the essential needs of people and generate additional wealth.
- A sustainable social system needs to provide for the general well-being of the population, including resolving tensions that occur when conflicts arise about which actions to take.
- A sustainable value system needs to be conservation-oriented with regard to all renewable and non-renewable resources.
- A sustainable technical program must be oriented to continue providing new solutions to existing and emerging problems.

In this context, we should think of Design for Sustainability as a “decision-making process that aims at achieving maximum benefits with minimum use of resources, by integrating all economic, social, human, environmental, and ecological concerns.”

For industry, Design for Sustainability fills the gap between Design for the Environment and Sustainable Development and Growth. It is similar to a natural ecological system in which waste produced by one part of the system becomes a raw material for other segments of the system. For example, one 3M plant generates waste plastic from the manufacture of computer data cartridges. Another 3M plant uses this waste plastic to manufacture antistatic trays for handling computer chips. The ideal Design for Sustainability is a closed-loop, zero-discharge system in which every waste is recycled completely, providing others with a source of raw materials or energy.

To contrast where we’ve been with where we are headed, consider the model for the conventional pollution control and pollution prevention approach to environmental management of the 1960s. It consists of three elements:

- Raw materials enter from the left.
- Products emerge from the right.
- Waste is created and recycled back into the system or treated.

The model for a Sustainable Growth is better thought of as consisting of three circles within each other:

- In the center, raw materials and waste are together, representing the alpha and omega of production. In this area, environmental management focuses on pollution control and pollution prevention.
- The next circle includes raw materials, product design, energy conservation, and product use and disposal. This circle represents Design for the Environment, an extension of the pollution prevention concept.
- The outside ring includes not only everything in the inner circles, but also ecological concerns, health and safety concerns, and availability of natural resources. This is where we establish Design for Sustainability.

All segments of society have a role in sustainable development:

- Government should build the principle of Design for Sustainability into decisions to amend or create policies and regulations, not only for environmental enhancement, but also for economic development, transportation, land use, and energy development.
- Academia needs to provide education, training, and new scientific and technical knowledge.
- The public must demand, and be willing to support, appropriate government and private-sector actions. Also, the public must be open to the idea of modifying patterns of consumption and lifestyle that are in conflict with the principles of sustainable development and sustainable growth.
- Industry must develop and implement manufacturing processes, new products, and services that are congruent with the principle of Design for Sustainability.

Together, government and industry must support and fund research in academic institutions to develop appropriate technologies and accelerate transfer of this technology to industrial and other applications.

Although we have gained a lot of knowledge and experience in four decades with environmental protection as a top public concern in this country, we still find ourselves without complete information and, again, have to act on the basis of incomplete information. However, let's remember that a trip of a thousand miles begins with a single step. We need to take that step and not worry about stumbling tomorrow. What we do today can make a difference tomorrow, and for generations to come.



## Facing Facts

by

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Over the past two decades the field of pollution prevention has been characterized by what is possible — by win-win options to dramatically reduce the environmental impacts of industrial operations while actually making companies money. Cliches about “waste reduction” in the 1970s yielded to debates in the 1980s over the definition of “pollution prevention,” with a clear resolution in the 1990s that the field is centered in changes to process inputs and operations and to products, rather than to waste management.

The 1991 Pollution Prevention National Report documented the emergence of a new field. State pollution prevention programs were blossoming across the country. In 1990, Congress had just enacted the Federal Pollution Prevention Act, making source reduction the top of a hierarchy of environmental management options. EPA leadership endorsed pollution prevention as its highest priority approach to its mission and established a pollution prevention office to oversee its adoption throughout Agency programs. Numerous pollution prevention initiatives were launched by industry, some within companies, others across whole sectors of the economy.

It has been hard not to be optimistic about the future of pollution prevention with the concept of pollution prevention being nearly universally endorsed as the best environmental management strategy by industry, government, and the public interest community; with pollution prevention being economically in the interest of companies as well as the economy as a whole; with an apparent plethora of pollution prevention initiatives that could be implemented quickly; and with an ever increasing number of individuals and firms experienced in pollution prevention.

But let’s face the facts. Pollution prevention to date has had no discernible impact on aggregate toxic chemical waste generation, and industrial practices in the United States. Waste generation reported to the Toxics Release Inventory is slowly rising and projected to continue to do so. The number of source reduction activities reported has declined each year. In industry, institutional barriers within companies continue to limit adoption of this approach. Too often the only people within companies with any pollution prevention responsibilities are those from Environmental Affairs and they are seldom the ones responsible for process design and operations within companies — the only folks who can carry out pollution prevention.

Moreover, pollution prevention is not at the center of environmental public policy today. The many ongoing discussions of, and experiments with, regulatory reform seem much more focused on the assessment of risks from industrial operations than on the cost saving options of pollution prevention. In addition, pollution prevention planning, once proposed as a national strategy and endorsed by industrial groups, is now under attack by some of the same groups in the few states which have attempted the approach.

Those of us in the pollution prevention community need to wake up and consider some new approaches to improve the future for pollution prevention. There is no reason to believe that there are any fewer pollution prevention opportunities now than there were two decades ago, when the field was just emerging — but we have yet to learn how to tap the environmental and economic benefits of such opportunities. We’ve learned how to talk pollution prevention, but are a long way away from putting it into action nationally.





## Sustaining Pollution Prevention

by

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We are in the midst of an environmental revolution, one that we will all be a part of and that will affect all of us. The success of this revolution will shape what our world will look like in the future, and its impact will be felt on the corporate world, on individuals, and on our institutions. We are presently in a stage of experimentation, the trying of new ideas and projects in search of a better, more long lasting answer to our environmental, social, and economic problems. It will fall on all of us to analyze the impact of these experiments and to set a policy course that can lead us to a more sustainable future.

Some common themes are emerging from a number of different disciplines and viewpoints. Whether we are concerned with protection of natural areas, maintaining biodiversity, pollution prevention, design for the environment, industrial ecology, or sustainable development, the common theme in all of these concepts is an emphasis on the environment as an important component in our planning and thinking. Whether we are a member of a local planning board, a design engineer for a major company, a politician or policy maker, a factory worker, or teacher -- we all have an important role to play in the environmental protection strategy of the future.

Pollution prevention in its simplest form is the reduction of the amount and/or toxicity of waste before it is ever generated. It is a concept that has quickly taken us beyond our traditional "command and control" approach to controlling waste and toxic emissions. Because the concept focuses on not generating waste in the first place, it has forced companies to look at the flow of chemicals in the workplace and to look at where and why wastes are generated. Environmental decision making has moved from the environmental manager back into the plant to the design engineers, process engineers, marketing personnel, accountants, and line personnel to name a few. Decisions related to pollution prevention have to be made before waste is ever generated, from those involved in product and process design and operation, to those making decisions about materials use. Involving people who have not traditionally had a role to play in environmental issues is a major challenge to a successful pollution prevention program.

Another challenge to an effective pollution prevention program is properly accounting for the true cost of waste. Unfortunately, our environmental regulations have not asked companies to collect the specific data on the origins of waste within an industrial facility that are needed to determine the appropriate pollution prevention strategy. It is only by understanding where and why waste is being generated that we can develop effective pollution prevention strategies. And it is only by having a good understanding of the cost of waste, particularly the cost of lost raw materials, that will lead a company to adopt many pollution prevention strategies that on the surface may look too expensive.

Many progressive companies are looking beyond traditional pollution prevention strategies to make their companies leaders in an ever more competitive global marketplace. A number of companies have adopted "design for the environment" concepts, basically looking at the raw materials in one generation of product becoming the raw materials of the second generation of product. This concept requires that a large amount of forethought be

given to the products and processes to ultimately conserve valuable materials and resources. AT&T for example, requires environmental considerations to be incorporated into product design from the outset. AT&T's vision is to be recognized by customers, employees, shareholders, and communities worldwide as a responsible company that fully integrates life-cycle environmental consequences into each of its business decisions and activities. Designing for the environment is a key in distinguishing their processes, products, and services.

Some are now viewing industrial ecology as a more overriding concept that includes pollution prevention, design for the environment, and life-cycle analysis as tools to move us toward a more sustainable future. Graedel and Allenby in their book *Industrial Ecology* define it as:

“the means by which humanity can deliberately and rationally approach and maintain a desirable carrying capacity, given continued economic, cultural, and technological evolution. It is a systems' view in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product, to ultimate disposal.”

Industrial ecology, as applied to manufacturing, requires familiarity with industrial activities, environmental processes, and societal interactions, a combination of specialties that is rare .

So, what does this portend for the future? It will require some major shifts in our thinking and in our basic environmental protection strategies. At least four things need to happen to make these changes successful:

- 1). Industry needs to take a leadership role in our future environmental protection strategies. According to Graedel and Allenby, responsible corporations may turn out to be among the global leaders in the transition between non-sustainable and sustainable development. I agree with this point, and have come to the conclusion that in the future, industry will need to take a leadership role in environmental protection, better uses of resources, and sustainable development.
- 2). Everyone has a role to play in sustainable development and environmental protection. There is a real need to change the way we educate our youth. If we are now saying to companies that for their pollution prevention program they need to involve design engineers, managers, lawyers, accountants, process engineers, etc., then colleges need to be training these people in the potential environmental role they will play when they enter the work force. We need to integrate environmental thinking and issues into a variety of curricula.
- 3). New partnerships will have to be formed for future environmental programs. Environmental protection will have to go well beyond the role of a state or federal regulatory agency just as it must go beyond the role of the environmental manager at a facility. Who will have an important role to play in the future to promote pollution prevention in businesses and industries? It may well be the bankers and accountants, the insurance providers, and the suppliers and vendors of chemicals and equipment. These are the trusted sources of information for small businesses, and they need to be giving an environmental message along with the other information they convey. The National Academy of Public Administration's 1995 report, *Setting Priorities, Getting Results: A New Direction for the Environmental Protection Agency*, stated that “to continue to make environmental progress, the nation will have to develop a more rational, less costly strategy for protecting the environment, one that achieves its goals more efficiently, using more creativity and less bureaucracy.” They see the goal of these changes as being a transition to a nation in which many more actors make better informed decisions and more efficient choices.

- 4). We need to consider the environmental consequences of all of our actions and we need to better determine the long-term costs and benefits of these actions. This is pertinent not only for an industry making decisions about the products it will make and the production processes it will need to make those products, but it is also important in considering our natural resources. Hundreds of millions of dollars are spent each year by people wishing to enjoy our natural resources, and yet we often fail to account for the economic value of our environment when we make decisions about land use and development. In the future, these natural resources will take on even greater value to those who wish to enjoy the environment around them.

We are at a point in history where we are seeing major changes in the way governments operate. Environmental programs are in a state of transition. Vice President Gore stated that “we are at a crossroads. The decisions we make today will determine whether we leave to future generations an attractive, livable world or an ever-escalating series of problems. More than ever, we must work vigorously to advance the twin goals of environmental protection and economic growth.” John Sawhill, president and CEO of the Nature Conservancy, stated in an interview with the *Harvard Business Review* “that integrating economic growth with environmental protection” is the conservation issue of the 1990s (Howard and Magretta, 1995). Pollution prevention has been an excellent approach to integrating economics and environmental protection. Now we must expand our thinking to look at pollution prevention as one of many tools needed to lead us to a sustainable future.



## Changing the Focus of Pollution Prevention

by

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I remember when the term pollution prevention first appeared on the scene. That term, or P2, the increasingly popular short-hand version, has come a long way since it was coined in the mid 1980s. Then, it was a bold new, largely untried idea to refocus the nation's regulatory attention further "up the pipe" and away from "end of the pipe" treatment options. Those who were around then must remember the seemingly endless discussions over just what the term did, and did not, mean. (And then there were those other ad infinitum discussions over the terms "waste minimization" versus "waste reduction.") Today, while there is still a significant amount of disagreement over just what should be included under the P2 umbrella (even though EPA has really tried to sell its somewhat restrictive definition), there is an extremely wide acceptance in both the public and private sectors that policies that encourage the elimination rather than just the control and treatment of pollution are good, and in the best interests of all concerned. However, there are still interminable discussions, but now they are about, "How do you measure P2?"

So what of the future of P2? To slightly modify a well-known statement from the world of political campaigns, "It's the products, stupid". To date, probably because the movement came out of the EPA, most of the focus has been on hazardous industrial waste and toxics. Consequently, there have been truly impressive reductions in these areas and for this both the regulators and the regulated community are to be commended. However, to employ a probably overused P2 standard analogy, we may have just about picked all of the low hanging fruit on the hazardous waste and toxic waste branches. We need to look to the products themselves for a couple of reasons. Clean products will drive cleaner technologies and, consequently, will contribute to reducing environmental risks across the board. Clean products will represent much less of a threat to environmental quality when they are used, recycled, and disposed of. This is bad and good news for the EPA. The bad news is that the EPA with its traditional regulatory focus on reducing and/or treating waste streams may not be able to do much to encourage the development and production of clean products. The good news is that regardless of its involvement in the process, the Agency will be able to take credit for the enhanced environmental quality that will result from the changes. With this in mind, the Agency should continue to search for "new and improved" approaches for influencing clean product development.

However, the truth may be that given the peculiar nature of cleaning up the environment by addressing products rather than waste streams, the EPA and its fellow State counterparts may not be the leaders. The leaders may turn out to be those agencies with more of an end product focus such as USDA for non-point source runoff and DOT for mobile sources of air pollution. Pollution prevention is a process rather than an end. This is often forgotten by the advocates who at times are so busy circling the wagons to protect the P2 programs from dilution into the greater scheme of things that they forget that it is only when the pollution prevention becomes second nature to all that we will reap the environmental benefits offered by the concept.

P2 advocates in the future are faced with the challenge of maintaining a high profile for the movement while so successfully incorporating pollution prevention into society's various sectors that a high profile is no longer needed.

I think the future is bright. There will certainly be disagreements among us as to just exactly how to pursue the goal, but I do not think there will be much disagreement about the goal itself. In fact, I think that as cleaner technologies continue to be adopted in all industrial sectors we will come to enjoy environmental successes not even dreamed of today. P2ers of the World Unite. We have only our inefficient and dirty production processes to lose. Onward!



## Moving Towards the Safe Use of Chemicals

by  
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Over the last decade, the concept of pollution prevention has not only entered the stage of environmental thinking but in a quietly revolutionary fashion made its way to front and center position. There is virtually no corner in either the public or private sector where it is not hailed as the number one strategy for addressing the potential hazards associated with the use of toxic substances and with industrial wastes. Its appeal has been not only its ability to affect dramatic reductions in plant wastes but also its potential for saving companies money, protecting workers better, and improving the efficiency of raw material use.

The public spotlight on pollution prevention will grow brighter in the period ahead for a variety of reasons:

- Industry progress in reducing plant wastes at their source has been only marginal. While the chemical industry's leadership has embraced the concept of pollution prevention and some companies have launched major plant-level initiatives, the message has clearly not yet penetrated in many plant operations. National Toxics Release Inventory production-related waste generation data has essentially remained unchanged. This is not surprising when INFORM research, published in our *Toxics Watch 95* report, showed companies having sought pollution prevention options for only one quarter of TRI waste streams they reported to EPA.
- Public concerns regarding the safety of toxic chemicals are growing. The fact that barely 10% of all toxic chemicals in commerce have been well characterized for their impacts on public health or the environment has long worried the U.S. citizenry. New information regarding the profound impacts that endocrine disrupting chemicals may be having on animal species and perhaps directly on human reproduction has heightened concern. It comes as perhaps only the latest of a series of nasty surprises -- which have included DDT, PCBs, CFCs, carcinogens, etc. Preliminary evidence suggests that this surprise may come closest to home -- potentially affecting every family's future.
- In the last decade we have realized that the threats to public and environmental health posed by toxic chemicals are much broader than we thought. While most public attention has focused on the some 4 billion pounds of waste from U.S. chemical plants, this is only one of many sources.

*Toxics Watch 1995* produced two significant perspectives on where our toxics problems lie. In doing the first public analysis of the U.S. Chemical Production Index, we discovered that the 4 billion or so pounds of toxic industrial wastes is dwarfed in comparison the the more than 6 trillion pounds of chemicals flowing annually into commerce. Contamination may be caused by exposures (depending on how chemicals are used and handled) at many points in this commercial flow.

Further, *Toxics Watch 1995's* analysis of data on a variety of "contaminated environments" found contamination sources to be, to a significant degree, toxic constituents incorporated in products used throughout the society -- from industrial solvents, to paints, to oven cleaners, to refrigerants, to adhesives, to pesticides.

The President's Council on Sustainable Development report this year has reinforced the importance of a new and more committed attack on this and other U.S. environmental problems. The PCSD report, representing a consensus of business, government and environmental leaders, has called for progress in this country toward truly "sustainable" ways of living -- one goal being to become a no-waste society. Yet from chemical making and using plants burgeoning in many parts of the world, the total global output of toxic wastes that must be managed and the overall flow of toxic chemicals through commerce is growing.

The good news of the past decade has been emergence of a preventive way of thinking about safeguarding our environment and better understanding of the scope of the problems we face. Such growing awareness makes it possible for government to set more appropriate policies and for business leaders to anticipate the scale of change and innovation that will be needed in the short and long terms.

### **What steps do today's realities suggest?**

First, that the same kind of business innovation that gave us the world of chemical products that have enriched our lives be applied toward new ends. Ingenuity must be used to achieve much greater progress in plant-level pollution prevention but also to prevent exposures to toxic chemicals in product or anywhere else in their flow through commerce. The goal? continuous progress toward zero exposures.

Second, to reassure the public that progress is occurring, data must be available that will enable citizens as well as government, as the chemical industry has said, to "track us" not "trust us." Trust will certainly rely on such information showing a new level of progress. To provide an adequate overview, public information would have to include full materials accounting data, now proposed by EPA as an expansion of TRI, and ultimately better data on chemical uses, especially in products.

If expanded information, combined with today's voluntary incentive and technical assistance programs do not stimulate much accelerated plant pollution prevention progress, then government may need to take further action: to require the kind of pollution prevention planning such as mandated in New Jersey, and that companies have acknowledged has enhanced their achievements; or to consider stronger economic drivers such as waste fees.

Third, the basic assumption underlying toxic chemical regulation -- that chemicals are "innocent until proven guilty" -- must be re-thought. The scant understanding that science has of chemical risks and the record of problems that have surfaced to date make this crucial. For newly proposed chemicals, the burden of proof has been on EPA to show risk before restricting production. Under this program only 4% of proposed chemicals have been restricted. More than 1000 new chemicals have entered commerce each year. Taking a preventive approach, it makes sense to place the burden of proof on manufacturers to show that new proposed chemicals ARE safe for intended uses -- with approval then granted just for these uses.

For the more than 70,000 chemicals already in commerce, EPA's economic as well as "risk-based" burden of proof for regulation has been virtually impossible to meet. While broader testing is needed, even if sufficient proof of a chemical's inherent toxicity were available, public policy's reliance on inherent risk as the sole or even primary basis for regulation would need modification. An approach based on current knowledge must reflect the fact that threats posed by toxic chemicals are not just due to their inherent risk but to what they are used for and where and how they are used. Exposure prevention as toxic chemicals move through commerce, like pollution prevention at industrial plants, makes sense as a guiding principle.

Finally, it would help insure the greatest learning curve on chemical safety, which is certainly in our interest and that of our children, if the results of all chemical testing done in the public or private sectors were made public and if the use of confidential business information were minimized.

While a number of leading chemical companies in the United States have recognized that successful continuation of their business relies on application of the pollution prevention concept and the concept of product stewardship in whole new ways, many more companies, large and small, must follow. Those who understand that these concepts must now be defined within a national goal of becoming a “sustainable society” and that this is a real and vital new vision are those that will thrive in the global marketplace of the coming century.





## Pollution Prevention in the United States: We've Come a Long Way!

by

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Pollution prevention, or source reduction, has been termed a strategy of first choice in addressing the highly complex environmental challenges of this decade. In fact, pollution prevention may be a very important *step* in our human understanding of how we collectively can and should fit into, and with, the Earth and its ecosystems. I have had the honor of working in the environmental field since the early 1970s and being part of EPA's pollution prevention efforts when they were officially organized in 1988 and at DOE's Office of Energy Efficiency and Renewable Energy since 1992. I have been very impressed with the public and private sector progress in both better understanding the complexity and the "interrelatedness" of environmental, economic, and social issues. I am also respectful of the significant challenges ahead, in terms of improving our understanding of both the interrelationships among all living things and the *significant* actions that must be taken in ALL sectors of our economy (industry, transportation, buildings, and energy generation) to continue our bridge-building toward a sustainable future.

### **Where We've Been**

If we look back to our agrarian roots, our Native American brothers and sisters and our ancestors not only understood and appreciated their relationship with the earth and other living things, but even incorporated these connections into their sacred traditions and belief systems. St. Francis of Assisi understood and lived his life according to principles of interconnectivity. Somehow, in the great technological strides of the industrial revolution, we lost sight of some of these basic understandings. The legacy of an extraction- and production- oriented economy has engendered a philosophy of taking, of limitless resources and limitless assimilative capacity of the environment. This "limited" thinking, coupled with the worldwide population explosion we are experiencing, has led to a new sense of crisis.

Since the passage of the National Environmental Policy Act in 1969 and the major environmental statutes of the 1970s and 1980s, our actions have been akin to triage in the medical field. The private and public sectors have made great strides in addressing the most pressing environmental problems in the air, water, land, and ground water. This is where we had to start. It was a treat- and- control set of strategies aimed primarily at toxic chemicals. By the mid to late 1980s, we were able to measure and "see" the improvements. The private sector also felt the economic hit of this approach. Compliance costs are currently estimated at over \$150 billion per year and are expected to increase to \$200 billion in the next five years.

There were several shortcomings to this triage approach. By trying to solve environmental problems in one media (air, land, water) at a time, we have tended to shift the pollutants from one media to another, rather than rethinking the need for the substance in the first place or examining the processes for efficiency opportunities.

This approach also often set up the thinking that economic and environmental progress were at odds with one another, rather than encouraging us to look for innovative solutions that deliver enhanced environmental results while truly helping a company's bottom line. And finally, control technologies have real technological limits. When one examines the population estimates (mentioned earlier in this report), the resource intensity of our planetary footprints and the limits of even the most innovative technologies..."you can't get there from here."

### Challenges and Opportunities

Although we have collectively made significant progress in the past eight years in both policy and project implementation, most of the implementation steps have been incremental. Paul Hawken states, "most educated people believe, or assume, that the major environmental threats faced by humankind can be fixed with relatively specific adjustments in technology and manufacturing practices." With some of the correct policy now in place, a key part of our challenge is to better understand the barriers to more substantial change in private and public sector actions. We need to work together in new partnerships to develop and implement creative solutions that will lead to *fundamental* changes in our lifestyle; proximity to work; transport systems; buildings; selection, design and production of products; redesign of industrial processes and ecological collocations of industrial facilities; and more fundamental applications of energy efficiency and mainstreaming renewable energy generation sources.

The deeper understanding of ecological prophets like Dr. Karl Henrik Robert (founder of the Natural Step), Paul Hawken, and Ernie Lowe needs to permeate our policy and our actions...not individual projects, but sustainable lifestyles. We need to reinforce the truly natural connections (not disconnections) between economic productivity, sustainability and enhancement of environmental quality and protection of cultural resources. Interconnectivity is key to true sustainability.

We must work together to forge even more lasting and creative public/private partnerships which result in technology "leaps," facilitate more fundamental behavioral and lifestyle changes and help broker creative financing to facilitate implementation. Innovative international lending institutions like the World Bank have recognized the value (both economic and environmental value) of investing in eco-efficiency projects in less developed countries. One of the huge opportunities in the United States in the next decade will be the niche financing market for domestic eco-efficiency projects. The new unregulated and entrepreneurial utilities, banks, leasing companies, energy/environmental full-service companies and the insurance industry will all have a role in developing this niche market and helping private sector companies make these more fundamental changes with creative financing.

In this new model, government moves into a role of research partner, broker of technical assistance and broker of financing assistance. I hope that this new role will be valued and supported. If so, the next decade of work will be even more rewarding and fun than the last.